

OU 1 RI  
FILE



UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

REGION VIII

999 18th STREET - SUITE 500  
DENVER, COLORADO 80202-2405

MAY 03 1990

Ref: 8HWM-FF

Mr. Robert M Nelson, Jr., Manager  
Department of Energy  
Rocky Flats Area Office  
P.O. Box 928  
Golden, CO 80402-0928

RE: Draft Phase III RI/FS  
Workplan for OU 1

Dear Mr. Nelson:

EPA has reviewed the February 6, 1990, draft Phase III RI/FS Workplan for Operable Unit 1 (OU 1) as required by the proposed Interagency Agreement. EPA's comments pertaining to this workplan are attached as are the comments submitted by our contractor

EPA generally believes this draft workplan shows improvement in DOE's ability to plan investigatory work, providing the basis for a final action to be taken at OU-1. It is important that this workplan provide the information needed to verify conclusions drawn based on invalidated data from previous investigations. This workplan must also result in an investigation designed to irrefutably delineate the nature and extent of contamination both horizontally and vertically within areas affected by OU 1

If you should have any questions related to these comments or wish to meet to clarify issues pertinent to this workplan, please contact Martin Hestmark or Nat Miullo of my staff at (303) 294-1132 or (303) 294-1134 respectively.

Sincerely,

A handwritten signature in cursive script, appearing to read "R. L. Duprey".

Robert L. Duprey, Director  
Hazardous Waste Management Division

cc: (all w/ attach)  
Peter Ornstein, 8ORC  
Mike Wireman, 8WM-GW  
Jim Lavelle, 8HWM-SM  
Joan Sowinski, CDH  
Tom Olsen, DOE  
Tom Greengard, EG&G

ADMIN RECORD

REVIEWED FOR CLASSIFICATION/UCM

By George H. Setlock

Date 6/12/90

A-OU01 00011

Comments on the draft Phase III RI/FS Workplan for  
the Rocky Flats Plant 881 Hillside Area (OU 1)

Section 1.4. The Workplan refers to aerial photographs not in the possession of the EPA. EPA requires a copy of all aerial photographs referenced in order to verify the evaluations presented within this workplan.

Section 1.4.6. If, as previously stated in section 1.4.4., asbestos and concrete were placed in these tanks subsequent to use, a pressure test of the tanks conducted after this placement would not reveal whether leakage could have occurred from these tanks.

Section 1.4.7. Although exact types and quantities of solvents stored at these sites are unknown, waste management history cited within the March 1, 1988, RI/FS for 881 Hillside does state that drums stored at sites 119.1 and 119.2 likely contained acetone and bis(2-ethylhexyl)phthalate. The March 1, 1988 RI/FS also states that these contaminants were likely to be found at chemical dumping areas (sites 102, 103 and 104).

Section 2.2.1.2. The preliminary results of the site wide seismic reflection geophysical survey being conducted at the plant indicate that the sandstones and siltstones may not be lenticular and are more likely to be continuous to some extent. The continuity of the sandstones at the hillside may be affected by the valley cut erosion of Woman Creek. However, the extent of the sandstone continuity needs to be determined. It is inappropriate to present geometric mean hydraulic conductivities for claystones (wells 5-87BR and 8-87BR) when only two packer tests were conducted. Hydraulic conductivities of the sandstones encountered during investigation of the 881 Hillside should be presented.

Section 2.2.2. This section should include some discussion of unsaturated flow. This section should also include discussion of vertical gradients between the overlying unconsolidated deposits and the Arapahoe sand units.

Section 2.2.2.1. It is unclear how well 47-87 (a dry well for the first quarter in 1988 and the first two quarters in 1989) can be used to justify the estimate of ground water flow velocity. The fact that 47-87 is a dry well for these three quarters is more an indication of improper monitoring location. The fact that PCE was found in well 64-86 also refutes the conclusion of an estimated ground water velocity of 200 feet in 18 years. DOE's reluctance to stand behind it's own estimates of ground water velocity is perplexing. DOE must present all analytical information for all wells

associated with OU 1 in the workplan, so that these types of statements can be verified in the data, regardless of the availability of temporally comparable background data. This section should also include discussion of ground water flow velocities in Rocky Flats alluvium.

Section 2.2.2.2. The discussion of ground water flow velocities in sandstone should distinguish whether these are weathered or unweathered sandstones. Hydraulic conductivities for claystones should also be presented.

Section 2.3.1. DOE must evaluate and revise the background geochemical report to address comments made on the report by both EPA and CDH. These comments indicated problems with some of the background tolerance intervals, maximum detected values and systematic problems associated with sample numbers. It was also evident that outlier calculations had not yet been performed.

As background temporal variability has not been established and presentation of all analytical data increases our ability to understand the problem, regardless of the data quality, the workplan must not exclude analytical information from presentation just because of the limited nature of the background data presently available or because it has now been rejected as invalid. Data should also be presented when it is below the tolerance interval maximum or maximum detected value. Presentation of this information is important to gaining a greater understanding of the problems at OU 1.

Section 2.3.2.1. Analysis of the soils data for OU 1 presented in February 24, 1989, Response to Comments on the 881 Hillside RI, indicates that methylene chloride and acetone are present in many of the laboratory blanks, but it cannot be stated that the levels in the blanks are relatively high levels. The majority of the laboratory blanks contain relatively low levels of methylene chloride and acetone.

The fact that phthalates are present in many of the soils samples may indicate a sampling problem, but it may also indicate contamination. In general the phthalate concentrations are orders of magnitude higher than the blank samples.

Trichloroethene was also found in borehole BH14-87 within the 6.5 - 9.0 foot composite. Tetrachloroethene was found below detection limit in borehole BH12-87 within the 0.0 - 2.5 foot composite. 1,1,1-trichloroethane was also detected below detection limit within borehole BH61-87.

Section 2.3.2.2. Borehole sample designations presented within

Table 2-6 do not correlate with the borehole logs presented in earlier RI reports. The designations within Table 2-6 indicate claystone samples are unweathered. Are the borehole composites being compared to the appropriate background samples if unweathered?

Both arsenic and cadmium occurred in soils at levels twice the upper tolerance limit. Given that the individual sites within OU 1 were used to dispose of different wastes and that boreholes were placed to characterize individual sites, the comment concerning randomness of metal concentrations exceeding background tolerance limits is unclear. Soils impacted by different disposal practices and wastes will be affected differently. DOE has not determined that the metals associated with the various sites within OU 1 are not the result of past disposal activities.

This section should also include a discussion of the presence of metals in the Woman Creek alluvial ground water.

Section 2.3.2.3. An environmentally conservative statistical analysis of radionuclide data would propose that if the error term plus the measured value of the sample is greater than the measured value plus the error term for the upper limit of the background range, the sampled value would be considered above background.

The uranium 233/234 to uranium 238 ratios presented in Table 2-8 are generally less than one, indicating that the uranium sampled in the surface scrapes is associated with plant activities. The fact that the cesium, tritium and total uranium concentrations are less than twice the background upper tolerance interval is irrelevant. The infrequency of uranium, cesium and tritium concentrations above background at depth may only indicate that the sampling and analysis presented within Table 2-7 was inadequate and did not characterize the sources of contamination. Cesium occurred above background in 17% of the soils samples. This is not infrequent. The data does not support the statement that radionuclide concentrations in soils represent natural variations.

It is unclear why surface scrapes were collected to characterize site 130, when this site has been covered with fill. Is the fourth paragraph of this section directed only to uranium, cesium and tritium results at depth? If so this should be made clear in the workplan. The workplan must present all data to evaluate against the tolerance intervals, not just those reported to be higher than the tolerance interval. Without this data, the ratio of uranium 233, 234 to uranium 238 cannot be verified for the previously collected data.

The 1989 CDH surface soils survey results indicate that the plant may be a source of cesium contamination. These results should be evaluated and compared to DOE sampling results.

Section 2.3.3. The ground water discussion for volatiles should not be limited to a discussion of second quarter 1989 data. Even if previously collected data has been invalidated, this data does shed light qualitatively on the nature and extent of the problem at OU 1.

Section 2.3.3.1. Well 1-87 does not appear to be upgradient of SWMU 145. It is possibly side gradient. Contamination in well 1-87 could be a result of the release at SWMU 145. This section should also discuss ground water problems associated with SWMU 177. An evaluation of all previously collected data should be presented to broaden the understanding of the nature and extent of volatile contamination at these sites. There should be a significant amount of information for all wells sampled between the phase II RI for OU 1 (1987) and second quarter 1989. Dry wells do not delineate the nature or extent of contamination.

Bedrock wells 3-87 and 8-87 both contained ground water contaminated with magnesium. All volatile organic, radionuclide, metal and inorganic data should be referenced and evaluated for the bedrock wells even if the data is only qualitative.

Section 2.3.3.2. The appendices presenting volatile organic information for colluvial wells associated with SWMUs 119.1, 119.2 and 130 describes many volatile hits as present below detection or analyzed but not detected, yet the analytical results indicate that the concentrations are present above detection limit. The appendices presented for the valley fill alluvial volatile organic analytical results only presents total xylenes.

Section 2.3.3.3. 8 ppb tetrachloroethene was also present in the second quarter 1989 sample for well 64-86. Until well 1-87 is sampled for inorganics and metals, there is very little chemical data to suggest that inorganic and organic contamination present at SWMUs 102, 103, 105, 107 and 145 is due to a source upgradient of well 1-87.

To state that contamination has not migrated to any appreciable extent is an opinion and should be deleted from the text. DOE's own estimate of ground water flow velocities refute the theory that contaminants have not migrated to any appreciable extent. The fact that

downgradient wells do not show contamination may only be an artifact of poor well location.

Section 2.3.4. DOE must present all analytical information related to surface water quality, not just the information from June of 1989. It is important to recognize surface water seeps as ground water. All surface water seeps should be analyzed and compared to appropriate ground water background data. The elevation of these seeps can also provide information pertinent to water table and potentiometric surface maps.

Section 2.3.4.1. The narrative presented within this section describing the dissolved metals results found to be above background does not correlate with the data presented within Appendix C. Radium 226, gross alpha and gross beta were found in the surface waters above background.

Section 2.3.5. The workplan should present the locations of the sediment sampling stations. This could be shown on figure 2-17. The workplan must identify plans to determine if sediments affected by 881 Hillside exist. The present locations of the sediment sampling stations are potentially impacted by OU 2. Sediment sampling stations must be identified that can more readily be associated with the problems at OU 1. Chloromethane, toluene and acetone were present at sampling station SED-29 at 60 ppb, 2J ppb and 18 ppb respectively. Trichloroethene was present estimated below detection limits at SED-25 and SED-26 at 5J ppb and 3J ppb, respectively. Chloromethane and trichloroethene were estimated at 19J ppb and 7J ppb, respectively, at SED-30. Trichloroethene was present at SED-31 at 8 ppb.

Aluminum, barium, copper, iron, magnesium, manganese, lead, potassium, lithium, zinc, mercury, strontium and vanadium were also found above background concentrations for sediment.

Section 2.4. The maximum concentration of acetone found within the 881 Hillside area is 57B ppb. The ARAR for acetone is exceeded. 1,1-dichloroethane is an Appendix VIII constituent; ethylidene dichloride, and background is therefore relevant and appropriate. Chloroform is present at 22 ppb in well 10-74. The ARAR for chloroform is 0.19 ppb.

Table 2-11 presents the ARAR units of measurement as micrograms per liter for the metals. The correct units of measure are milligrams per liter for metals. Table 2-11 presents the preliminary ARARs for tetrachloroethene and 1,1,2-trichloroethane as below detection limits. This is incorrect. The preliminary ARAR for tetrachloroethene and

1,1,2-trichloroethane is 50 ppb for both constituents, not 10 ppb. The ARAR for toluene is 2000 ppb, not 2420 ppb.

The correct detection limit for dissolved cesium is 0.1 ppm, not 1.0 mg/l. The correct detection limit for lithium is 0.01 ppm, not 0.1 ppm.

Section 2.5. This section presently identifies only one technology for treatment of radionuclide contaminated soils. This section should present other potential technologies to evaluate for treatment of radionuclide contaminated soils.

Table 2-13 does not present the data requirements necessary to evaluate the effectiveness of attrition scrubbing of soils for removal of plutonium.

Section 3.1. With regard to the conclusions drawn from the phase I and phase II investigations, the reason radioactive contamination has not been detected at SWMU 130 is due to inadequate characterization. Can it be stated that soil contamination by volatile chlorinated hydrocarbons is limited to soils in the vicinity of BH01-87, BH57-87 and BH58-87 in light of the validity of the borehole analytical results? How will this data be used and what conclusions can be drawn from the invalidated data? Confirmatory borehole drilling should be conducted to verify the extent of the soil contamination.

Section 3.2. It would benefit the reviewers of the workplan to be given the appropriate sections of the SOP and QA/QC plans pertinent to the work anticipated at the 881 Hillside in order for the reviewers to completely understand the work to be performed. Data quality objectives also need to recognize the data and data quality requirements predicated by potential remedial alternatives to be evaluated and utilized.

Under the objective of characterizing site physical features, Table 3-1 must include determination of the location of the various weathered and unweathered bedrock units (claystones and sandstones), their lateral and vertical extent, interconnection with the overlying alluvial/colluvial materials, ability to transport contaminants and flow directions within these bedrock units. This objective must also include as data needs, preparation of detailed east-west and north-south geologic cross sections and determination of vertical gradients.

Under the objective of characterizing the nature and extent of contamination, Table 3-1 must include determination of the radionuclide contamination associated with SWMU 130. This objective must also recognize the new location of some

of the SWMUs as presented in section 1.4 of the workplan. The objective of characterizing the nature and extent of contamination must include as a data need, determination of the nature and extent of contamination within the bedrock materials associated with 881 Hillside. In characterizing surface water quality, Table 3-1 must include as a data need locating and sampling sediment stations directly associated with 881 Hillside if possible.

Under the objective of providing a baseline risk assessment, phase III results must be incorporated into the risk analysis.

Section 4.1.3. The field investigation is designed to meet the objectives outlined in section 3.0, not section 4.0.

Boreholes must also be constructed and sampled to verify the nature and extent of contamination. Previously collected information has been invalidated and the results must be verified.

Section 4.1.5.3. Care must be taken in the use of kriging to contour isopleths as this method can oversimplify the problem and does not have a very good track record.

Section 4.1.6. In general, the draft workplan for the baseline risk assessment conforms to EPA guidance for risk assessments. However, you should be aware that the region is now in the process of developing a "generic" workplan for risk assessments. Once completed, EPA will forward this information to you. This workplan will, in general, conform to plans now in existence and those under development in other regional offices. Included in the workplan will be a set of regionally specific exposure parameters to be used in the exposure assessment portion of the baseline risk assessment. Deviation from these exposure parameters will require adequate documentation, and the approval of EPA.

Objective 2 includes fate and transport analysis within environmental media. It is also essential that the baseline risk assessment address cross-media fate and transport. For instance, such analysis must include contamination of ground water from soil sources, contamination of air from soils or water, etc.

In addition to the documents listed in Table 4-1, EPA will be using documents included on the attached list for development and review of the baseline risk assessment.

The following criteria must be used in identifying chemicals to be addressed in the baseline risk assessment:

- a.) Those chemicals positively detected in at least one CLP sample (RAS or SAS) in a given medium, including chemicals with qualifiers attached indicating known identities, but unknown concentrations.
- b.) Chemicals detected at levels elevated above background.
- c.) Chemicals which have been tentatively identified and may be associated with the site based on historical information, or have been confirmed by SAS.
- d.) Transformation products of site associated chemicals.

Chemicals must not be eliminated based upon environmental fate predictions until the exposure assessment phase of the baseline risk assessment is completed.

Scenario selection should proceed regardless of the ability to quantify exposure. This may require exposure to be addressed qualitatively under circumstances where quantitative evaluation is not possible.

It may be advantageous to consider receptor characteristics rather than "exposure scenarios" for the purpose of the baseline risk assessment. Each of the scenarios listed include several of the same receptor subpopulations. To avoid a duplication of effort, it may be more efficient to directly assess exposure and potential toxicity to subpopulations.

It is not clear what is meant by the statement "Doses or the dose might result in an excess cancer risk for noncarcinogenic health". Please explain.

It will be unnecessary to generate toxicity values for subchronic exposure. Chronic exposure will provide a more conservative assessment and will drive the rationale for any cleanup activity which may be indicated.

The preferred terminology for acceptable intake for chronic exposure (AIC) is now "risk reference dose" (RFD). To avoid confusion, this terminology should be used throughout the baseline risk assessment and the AIC terminology should be discontinued.

The reasonable maximum estimate of exposure (RME), based upon the 95% upper confidence limit of the exposure data, must be used throughout the baseline risk assessment process. Details must be provided regarding the rationale and methodology for development of subchronic exposure

estimates.

Where applicable, assessment of sediment toxicity must be included in the environmental portion of the risk assessment.

Section 4.1.7. As soils contaminated by radionuclides exist at the 881 Hillside, treatability studies germane to the 881 Hillside must also focus on treatment technologies designed to remove radionuclides from soils.

Section 4.2.3. The narrative describes submittal of a draft Final FS, a revised draft Final FS and preparation of a Final FS incorporating public comments. The IAG does not anticipate the FS going to public comment. However, the FS is used to support the Proposed Plan which does go to public comment. This section should be clarified to reflect the requirements of the IAG and CERCLA.

Section 5.0. The overall objectives of the Phase III RI must include better definition of the nature and extent of bedrock contamination and bedrock ground water contamination.

Section 5.1. Bedrock wells should be installed where borehole sampling indicates bedrock is contaminated. The installation of bedrock wells must not be limited to locations where weathered sandstone is encountered within source areas.

Section 5.1.1.1. Given the potentiometric surface presented in figure 2-3, it may be appropriate to locate well MW03 30 to 50 feet east of its presently proposed location. The well needs to be located downgradient of the retention pond.

Section 5.1.1.2. The downgradient monitoring well, MW05 needs to be constructed downgradient of the site. The potentiometric surface map in figure 2-3 must be used to locate this well.

Section 5.1.1.4. Boreholes BH17 and BH18 should be located on the southern sides of the tank locations.

Section 5.1.1.6. It is stated that ground water samples will be taken within this SWMU, yet no wells are proposed for this location.

Section 5.1.1.8 The borehole samples taken from SWMU 130 need to be carefully planned as the exact depth at which radionuclide contamination is present is unknown due to the disturbance at the site and placement of fill over the site.

Section 5.1.1.9. SWMU 145 is at the southwest corner of building

881. The RI summary presented within section 2.3.3.1. indicates that well 1-87 is above background for certain major ions, trace metals and organics. This well is not upgradient of SWMU 145. It is possible that the problems associated with well 1-87 are a result of contamination from SWMU 145. This site should be more directly sampled to verify that no further action is required.

Section 5.1.1.10. It is the understanding of EPA that any ground water problems associated with this site would be addressed under the RI/FS process. If this is true, the nature and extent of ground water contamination associated with this site needs to be determined

Section 5.1.2.1. DOE must evaluate the need to modify procedures to analyze constituents to a lower limit of detection for contaminants where the CLP detection limit is above the ARAR.

Section 5.2.1.1. A monitoring well should also be located in the bedrock sandstone immediately downgradient of SWMU 130.

Section 5.2.1.2. The deletion of parameters from further analysis must not be implemented prior to review and approval by EPA and CDH.

Section 5.2.1.3. The proposed hydraulic testing should also include determination of vertical gradients between the confined Arapahoe sandstones and the surficial geologic units. This section should also specify the methods proposed to analyze the hydraulic testing data.

Section 5.2.2.1. The workplan must locate the bedload sampling stations used for the October, 1989 sediment sampling. As previously stated in these comments, the sediment sampling stations must be located to determine effects of 881 Hillside. Previously sampled stations were unable to distinguish between affects from OU 1 and OU 2. Dependent on the location of these sediment sampling stations, more sampling stations may have to be established and sampled during the phase III RI. Flow measurements/estimates of surface water discharges during sampling should be made concurrently.

Section 5.3. It should be clarified that the IM/IRA proposes discharge of the treated ground water.

Section 5.3.5. This section should provide more information on how the packer tests will be conducted and how the data will be analyzed.

## RISK ASSESSMENT IN SUPERFUND

The following are selected program guidances and other key documents useful in the conduct of Superfund risk assessments (current as of July 1989). Unless otherwise noted, further information on these materials can be obtained by calling the Toxics Integration Branch in the Office of Emergency and Remedial Response at 202-475-9486.

"Superfund Public Health Evaluation Manual (SPHEM)" -- Office of Emergency and Remedial Response, (October 1986) EPA/540/1-86/060. The current program risk assessment guidance manual. Explains how to conduct a baseline site risk assessment, set preliminary remediation goals, and evaluate risks of remedial alternatives. Currently under revision; revised interim final expected by summer 1989.\*

"EPA's Integrated Risk Information System (IRIS)" -- Office of Research and Development, (continuously updated). Agency's primary source of chemical-specific toxicity and risk assessment information. Includes narrative discussion of toxicity database quality and explains derivation of Reference Doses, cancer potency factors, other key dose response parameters. IRIS presents information that updates data originally presented in Exhibits A-4 and A-6 of the SPHEM (see above). Further information: IRIS Users Support, 513-569-7254.

"Health Effects Assessment Summary Tables (HEAST)" -- Office of Research and Development/Office of Emergency and Remedial Response, (updated quarterly). Since the IRIS chemical universe (while growing) is currently incomplete, the HEAST has been produced to serve as a "pointer" system to identify current literature and toxicity information on important non-IRIS chemicals. While HEAST data in some cases may not be "Agency-verified", the information is considered valuable for Superfund risk assessment purposes. Available from Superfund Docket, 202-382-3046.

"Exposure Factors Handbook" -- Office of Research and Development, (March 1989) EPA/600/8-89/043. Provides statistical data on the various factors used in assessing exposure; recommends specific default values to be used when site-specific data are not available for certain exposure scenarios. Further information: Exposure Methods Branch, 202-382-5988.

"OSWER Directive on Soil Ingestion Rates" -- Office of Solid Waste and Emergency Response, (January 1989) OSWER Directive #9850.4. Recommends soil ingestion rates for use in risk assessment when site-specific information is not available. Available from Darlene Williams, 202-475-9810.

"Superfund Exposure Assessment Manual (SEAM)" -- Office of Emergency and Remedial Response, (April 1988) EPA/540/1-88/001. Provides a framework for the assessment of exposure to contaminants at or migrating from hazardous waste sites. Discusses modeling and monitoring.\*

"Risk Assessment Guidance for Superfund -- Environmental Evaluation Manual, Interim Final (RAGS-EEM)" -- Office of Emergency and Remedial Response, (March 1989) EPA/540/1-89/001A. Provides program guidance to help remedial project managers and on-scene coordinators manage ecological assessment at Superfund sites.

"Superfund Risk Assessment Information Directory (RAID)" -- Office of Emergency and Remedial Response, (November 1986) EPA/540/1-86/061. Describes sources of information useful in conducting risk assessments. Currently under revision.\*

\*Available from Center for Environmental Research Information, 513-569-7562.

EPA 540/12-89/002 Risk Assessment Guidance for  
Superfund Human Health  
Evaluation manual

**ROCKY FLATS PLANT  
Jefferson County, Colorado**

**TECHNICAL REVIEW OF PHASE III  
REMEDIAL INVESTIGATION AND FEASIBILITY STUDY  
WORK PLAN FOR OPERABLE UNIT NO 1**

**Prepared for**

**U S ENVIRONMENTAL PROTECTION AGENCY  
Region VIII Superfund Remedial Branch  
Denver, CO 80202**

<b>Work Assignment No</b>	<b>C08006</b>
<b>EPA Region</b>	<b>8</b>
<b>Site No</b>	<b>CO789001526</b>
<b>Date Prepared</b>	<b>April 5, 1990</b>
<b>Contract No</b>	<b>68-W9-0009</b>
<b>PRC No</b>	<b>012-C08006</b>
<b>Prepared by</b>	<b>PRC Environmental Management, Inc (Jim Wulff, Jeff Reichmuth)</b>
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## 1.0 INTRODUCTION

The U S Environmental Protection Agency (EPA) requested that PRC Environmental Management, Inc (PRC) review the "Phase III Remedial Investigation and Feasibility Study (RI/FS) Work Plan II (RI work plan) for the Hillside 881 Area at Rocky Flats The RI work plan was submitted by the U S Department of Energy (DOE) PRC reviewed this document under the Technical Enforcement Support (TES) XII Contract, Work Assignment C08006

The technical review comments are keyed to appropriate sections of the document PRC reviewed the RI work plan for compliance with the "Rocky Flats Federal Facility Agreement and Consent Order (IAG)," the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), and other appropriate environmental statutes, regulations, and guidance PRC also determined whether the RI work plan incorporated or addressed "EPA Comments on Rocky Flats Plant Remedial Investigation Report, 881 Hillside Area," submitted 1 March 1988 It should be noted that the site characterization in the RI work plan is based largely on the "Draft Background Geochemical Characterization Report (DBGCR)," dated December 1989 A complete analysis of the data collected and statistical procedures used in the DBGCR is beyond the scope of this review Typographical and editorial errors within the RI work plan have not been addressed

## 2.0 TECHNICAL COMMENTS

1 Section 2.2.2.1, Page 2-15, Paragraph 3. The text provides an estimate of ground water flow velocity based on the downgradient extent of volatile inorganic contaminants from a source This approach is not sound because it does not consider the possible chemical and biological processes that can facilitate or retard movement of a contaminant, nor does it consider the effect that seasonally unsaturated conditions may have on contaminant transport In most cases, velocity will be underestimated as the net result of these processes, as it is in this case The flow velocity estimate of 11 to 13 ft/yr is five times less than the flow velocity estimate of 61.7 ft/yr that PRC computed using the minimum hydraulic conductivity of  $4 \times 10^{-5}$  cm/sec reported on page 2-15

2 Section 2.2.2.2, Page 2-17, Paragraph 4 The results of the 1987 slug tests and the 1986 and 1987 packer tests should be presented in this paragraph The text states that three sets of aquifer tests were performed to estimate the hydraulic conductivity of sandstones, however only the results of the 1986 drawdown-recovery test are presented in this paragraph

7

3     Section 2.3.2.1, Page 2-28, Paragraph 2. This paragraph states that volatile organic data for soils have been rejected during the data validation process because the data did not meet quality control specifications. An explanation of why the data did not meet quality control specifications should be given.

4     Section 2.3.2.1, Page 2-37, Paragraph 2. The soil sampling objectives should include a statement that samples will be analyzed for the entire suite of volatile organic compounds, as listed in Table 2-5, thereby providing a quantitative determination of volatile organic contamination.

5     Section 2.3.2.2, Page 2-37, Paragraph 3. This paragraph reports metal analytes that exceeded background, based on the criterion given on page 2-19 for consideration of a constituent concentration that is greater than the one-sided 95 percent tolerance interval at the 95 percent confidence level as preliminarily representing contamination. However, the possibility that these metal concentrations represent background is subsequently discounted on the basis of two vague and arbitrary criteria. (1) the concentrations occur "randomly" throughout the 881 Hillside soils and (2) the concentrations "did not exceed a factor of two of the upper limit of the background tolerance interval or range." These criteria should not be substituted for tolerance intervals to determine whether a constituent concentration preliminarily represents contamination, nor should they be used to qualify the results of the tolerance interval analysis without being adequately explained or referenced.

Furthermore, the list of trace metals exceeding background does not include zinc (9.2 percent of the samples), aluminum (8.0 percent), chromium (5.7 percent), strontium (5.7 percent), iron (3.4 percent), cobalt (2.3 percent), nickel (2.3 percent), and vanadium (2.3 percent). Cadmium exceeds its highest background value by a factor of two in 17 percent of the samples, but is not considered a possible contaminant. These analytes should be preliminarily considered to represent contamination, based on their tolerance intervals.

6     Section 2.3.2.2, Page 2-37, Paragraph 3. Appendix A shows that the results for cesium, lithium, molybdenum, and tin were not reported. It should be stated that these analytes were not reported, and an explanation for their omission should be provided.

7     Section 2.3.2.3, Pages 2-37 through 2-42. Section 2.3.2.3 describes the nature and extent of radionuclide contamination of soils in the 881 Hillside area but presents ambiguous and contradictory statements that are based on poor supporting data.

Paragraph 2 on page 2-38 presents the results of the 1987 soil sampling effort. The text states that 12 to 24 inch composite samples were obtained to characterize surface contamination. These data are summarized in Table 2-7 on page 2-39. The first sentence on page 2-42 implies that the data in Table 2-7 were derived from the raw data contained in Appendix A. However, examination of Appendix A reveals that only two surface sample depth intervals (BH1-57 and BH58-87) are less than 24 inches, the majority of the surface sample depth intervals are in the 5- to-10 foot range. The text should be revised to state the correct sample depth intervals. Furthermore, Table 2-7 does not specify sample depth intervals for "surface" and "subsurface" samples.

The large composite soil sample depth intervals cited in Appendix A are not capable of yielding meaningful information on the distribution of radionuclides in the vertical soil profile. This is due to the dilution of high concentrations of radionuclides (particularly in the surface layer) with relatively uncontaminated soil. The statement on page 2-38 that "the origin of this contamination is likely the 903 Pad Area resulting from wind dissemination of plutonium/americium contaminated dust" cannot be justified on the basis of these soil sampling results. Table 4 in the 1976 EPA guidance document "Evaluation of Sample Collection and Analysis Techniques for Environmental Plutonium" shows that 2.5-cm intervals can be obtained using the trench/tray method, while 5.0-cm intervals can be obtained with an auger. This guidance document also recommends that a surface sample depth interval should be 5.0 cm.

Paragraph 1 on page 2-42 uses the uranium isotope ratio (U-233/234 to U-238 activity ratio) to identify borehole radionuclide concentrations as natural background concentrations. However, these ratios are not presented in Table 2-7, nor can they be derived from the data contained in Table 2-7 or Appendix A. The ratios cannot be calculated from Appendix A data, because Appendix A does not present all soil sampling data above detection limits (see comment 41). Supporting data should be presented in either the text or appendices.

It should be noted that analytical results for uranium 235 (U-235) are not reported in Appendix A. If this information cannot be reported, an explanation should be provided in Section 2.3.2.3. The ratio of U-235 to U-238, when compared against a background ratio, can indicate the presence of uranium that is enriched as a result of uranium processing activities. The soil concentrations of U-235 are essential information and should be provided in the RI work plan.

8      Section 2.3.3, Page 2-42, Paragraph 4 This paragraph states that the first quarter 1988 data were included in Appendix B because they are the most recent data pertaining to the same season for which the background ground water tolerance intervals were calculated. The resulting

data set is very small due to the number of dry wells encountered during the sampling period. This is especially true of the Rocky Flats alluvium data set; reportable results were provided for only one well out of three. If additional validated data sets are available, they should be included in the appendix. If it is felt that data from the second, third, or fourth quarters cannot be compared to tolerance intervals derived from first quarter data, then new tolerance intervals should be developed that are applicable to all four quarters.

9      Section 2.3.3.1, Page 2-48, Paragraph 1. The text states the elevated uranium concentration in well 1-87 suggests that the general inorganics and low level organic contamination in this area (OU-1) may not be from the OU-1 solid waste management units (SWMUs). It is not understood how the test results for one analyte (uranium) from a sidegradient well can be used to characterize all inorganic and organic contamination in the vicinity of seven SWMUs at 881 Hillside. This should be explained.

10     Section 2.3.3.1, Page 2-48, Paragraph 2. It should be noted in this paragraph that uranium 235 was detected at a level greater than two times background in well 8-87.

11     Section 2.3.3.1, Page 2-48, Paragraph 2. This paragraph should state that the concentration of strontium in well 8-87 (1 768 mg/l) exceeds the upper limit of the background tolerance interval by a factor of three.

12     Section 2.3.3.2, Page 2-49, Paragraph 1. The statement "it appears that volatile organic contamination in the colluvial ground water is limited in proximity downgradient of SWMU 119 1" is vague and has little supporting data. This statement appears to be based on the absence of detectable quantities of volatile organics at well 64-86, which is located 800 ft downgradient from SWMU 119 1 and on the south side of the south interceptor ditch. Wells 47-87, 48-87, 49-87, and 6-87, which are located north of the south interceptor ditch and closer to SWMU 119 1, are all dry. This discussion was supported by Appendix B data. Other data sets should be used to support the discussion, because Appendix B data were gathered during a dry season (see comment 8).

13     Section 2.3.3.2, Page 2-49, Paragraph 2. Colluvial well 43-87, located at the downgradient edge of SWMU 119 1, also has levels of total dissolved solids (TDS) and major ions significantly above background concentration. TDS have been detected at greater than three times the background level. Nitrate, chloride, and sulfate have been detected at greater than 16, 12, and 2 times background levels, respectively. This should be noted in the text.

14 Section 2.3.3.2, Page 2-52, Paragraph 3. This paragraph states that uranium is the only radionuclide detected above background in alluvial ground water downgradient of SWMUs 119 1, 119 2, and 130. It should be noted that sampling results for strontium 89, 90, and cesium 137 were not reported for all wells, and americium 241 results were not reported for wells 9-74, 10-74, and 43-87

15 Section 2.3.3.2, Page 2-60, Paragraph 1. The conjecture that well 43-87 is sidegradient to a single source of uranium located upgradient of well 6-87 is not supported by the fact that the concentration of uranium isotope 235 is much higher at well 43-87 (greater than 14 times background), than at well 6-87 (greater than 3 times background)

16 Section 2.3.3.2, Page 2-60, Paragraph 3. Lithium has also been detected at a concentration that is significantly above background at bedrock well 5-87 (25 times above background) Lithium should be included in the discussion of the analytes that were detected above background at well 5-87

17 Section 2.3.3.2, Page 2-61, Paragraph 1. This paragraph lists trace metals that were detected at levels slightly above background ranges in well 45-87 However, many of these analytes (barium, copper, iron, lithium, silver) were not detected in background ground water samples The statement that these metals were " slightly above background" is not clear and these concentrations should be compared to applicable or relevant and appropriate requirements (ARARs) or detection limits

The statement that manganese was detected at a level slightly above background is contradicted in Appendix B-5 2 Appendix B-5 2 shows that manganese was detected at a level greater than seven times the background level for unweathered sandstone The text should resolve this contradiction

18 Section 2.3.3.3, Page 2-61, Paragraph 2 There may be a discrete source of lithium contamination upgradient of well 5-87, which is located in SWMU 119 1 This should be noted in the discussion of discrete sources

19 Section 2.3.5, Page 2-65, Paragraph 3 There should be a figure depicting sediment sample stations at 881 Hillside

20 Section 2.3.5, Page 2-66, Paragraph 4 The conclusion that the plutonium found in the samples from stations SED-25, SED-26, SED-29, and SED-30 is likely attributable to "wind

dissemination of plutonium contaminated surface soil from the 881 Hillside Area," must be supported

21 Section 2.4, Table 2-11. This table lists the ARARs, detection limits, and maximum concentrations for compounds and elements detected at the 881 Hillside area. The units designated in the ARAR column for inorganics and radionuclides appear to be incorrect. ARAR units for inorganics are usually given in milligrams per liter. The units should be changed from micrograms per liter to milligrams per liter. The values given for ARARs would then be consistent with the values given in the Colorado Department of Health (CDH) Classifications and Numeric Standards, South Platte River Basin (1990) for many metals and all conventional pollutants. The CDH South Platte River Basin standards should be considered applicable as ARARs, even though they are considered as goals for Woman Creek, upstream of Pond C-2, until February 1, 1993. ARAR units for radionuclides should also be changed from micrograms per liter to picocuries per liter. The values given for ARARs would then be consistent with the CDH South Platte River Basin standards. Units should also be designated for maximum concentrations.

ARARs are identified to assure compliance with environmental standards during and after remedial activities. Remedial activities that are presently being studied, will probably not be implemented at OU1 until after 1993. Two organic ARARs should be updated to be consistent with the South Platte River Basin standards that are scheduled to go into effect in 1993: (1) tetrachloroethane ( $0.8 \mu\text{g/l}$ ) and (2) 1,1,2 trichloroethane ( $0.6 \mu\text{g/l}$ ). Although these ARARs are below the current detection limit of  $1.0 \mu\text{g/l}$  for both compounds, the regulatory agencies are assuming detection limits will be lower in 1993.

22 Figure 2-16. It appears that the 30 pCi/l contour lines were drawn to exclude well 49-87, which is dry. The most conservative interpretation of the 30 pCi/l contour line that could be made using the available data would show wells 43-87, 4-87, and 6-87 encircled by a single contour line. The 30 pCi/l contour line should be redrawn.

23 Section 2.5, Table 2-12, Page 2-77. This table provides general response actions and corresponding potential component remedial technologies to be evaluated during the 881 Hillside FS. When considering on-site treatment and backfill technologies (see associated remedial technologies column), solidification and stabilization should be presented as an option. In-situ contaminated soil treatment technologies to be considered in the FS should include biodegradation. Additionally, coagulation and precipitation technologies should be considered for treatment of ground and surface water (for example, addition of aluminum sulfate or ferric chloride for the removal of metals).

24 Section 2.5, Table 2-13, Page 2-79 This table provides the specific data requirements necessary to evaluate the identified technologies. It should be made clear in the table that a full suite of inorganic and organic analyses is necessary in order to adequately evaluate technologies other than thermal treatment technologies.

The data needed in order to evaluate the technical feasibility and cost effectiveness of thermal technologies can be obtained by an ultimate analysis on contaminated soil. In addition to an ultimate analysis, an analysis to determine the higher heating value will be necessary. The term BTU content is inconclusive.

25 Section 3.1, Page 3-2, Paragraph 1 Conclusion four states that "confined ground water flow occurs in deeper sandstones." If there are any data to substantiate this conclusion, they should be presented in the text.

26 Section 3.1, Page 3-2, Paragraph 1 Conclusion nine is based on poor-quality data. Accurate determinations of surface and subsurface radionuclide contamination cannot be made using composite soil sample intervals in the 5-to-10 foot range (see comment 7). This conclusion should be deleted unless acceptable supporting data can be presented.

27 Table 3-1, Page 3-5 This table states that collecting surface soil scrapes will fulfill the data quality objective of determining the horizontal and vertical extent of surficial radionuclide soil contamination due to wind dispersion. The conclusion that radionuclide soil contamination is surficial and attributable to wind dispersion should not be made because the supporting data are poor in quality (see comment 7). Therefore the data quality objective should be restated as "to determine the horizontal and vertical extent of radionuclide soil contamination." The vertical distribution of radionuclides can be characterized by excavating trenches and sampling the trench walls at small, discrete intervals. The sampling should be continued to the depth necessary to characterize possible radionuclide leakage from SWMUs.

28 Section 4.1, Page 4-1 Section 4.1 specifies various tasks for the RI. As specified in "guidance for Conducting Remedial Investigations and Feasibility Studies Under CERCLA," health and safety protocols should be identified in the preparation of a RI. This activity should be included in Section 4.1.

29 Section 4.1.3, Page 4-2, Paragraph 1 This section states that "the Phase III RI/FS field investigation is designed to meet the objectives outlined in Section 4.0." An outline of these objectives is not provided in Section 4.0. It is suspected that a typing error was made, and Section 4.0 should read Section 3.0 in this statement.

30     Section 4.1.5.3, Page 4-4, Paragraph 3   The text states, "for organic compounds, any detectable concentrations in samples that are not attributable to laboratory contamination will be considered likely evidence of contamination " Procedures and criteria that are to be used to determine laboratory contamination should be stated in this paragraph

31     Section 4.1.6.1, Page 4-8, Paragraph 1   This section states that, for the risk assessment, " all contaminants at Operable Unit No 2 will be considered unless the following criteria are met for their deletion.

- Determination that a chemical has not been detected above risk based detection limits,
- Environmental fate information which shows that exposure will not occur, or
- A low frequency or occurrence (less than 10 percent) in environmental media "

It is not clear if all three criteria must be met or if just one of the three criteria must be met to consider deleting a contaminant In addition, the term risk based detection limits should be defined

The meaning and rationale for the third criterion are unclear and should be explained Although a contaminant may be detected infrequently, its concentration could be high enough to warrant remediation

32     Section 4.1.6.2, Page 4-12, Paragraph 5   This discussion of the environmental evaluation states that the investigation will include the collection of several types of organisms to determine if there is a bioaccumulation of contaminants in the vicinity of OU2 The remainder of the discussion does not describe the procedures used when determining whether bioaccumulation has occurred This should be added to the discussion

33     Section 4.1.6.2, Page 4-13, Paragraph 4   The text discusses biomarkers However, the discussion of population-ecosystem density, diversity, or nutrient cycling as measured in individual organisms does not indicate an understanding of the methods used to evaluate ecological systems This, in turn, suggests that biomarkers are not well understood The discussion should be rewritten with an explanation of the specific procedure to be used for the Rocky Flats evaluation

34     Section 4.1.6.2, pages 4-12 and 4-13   The text discusses the need for field and laboratory activities that would determine the effects of contaminants from the facility on the area's flora and fauna. The discussion of field activities in Chapters 3 and 4 do not indicate even the possibility of field work for biological systems. If ecological field activities are to be part of the Phase III RI work, they need to be described in the work plan. The environmental risk assessment should be described based on actual projected Phase III activities.

35     Section 4.1.7, Paragraph 1, Page 4-14   It is indicated that treatability studies and pilot testing to be conducted or reviewed will focus on removal of metals and organic compounds from water. Three water treatment technologies are being considered for treatability studies and pilot tests and two have already been performed. Specific treatability studies and pilot tests for soil treatment technologies, on the other hand, are not mentioned. The rationale for emphasizing water treatment technology testing should be specified.

36     Section 5.1.1.5, Page 5-6, Paragraph 1   The text states that if the Building 887 sewer pump is not found to be the source of SWMU 106, no further investigation of the site will be needed. It does not state what other possible sources may exist, and what steps would be necessary to verify the source.

37     Section 5.1.1.9, Page 5-8, Paragraph 4   The text states "as no hazardous or radioactive constituents were released to the environment by this leak and the leak was repaired, no further investigation of this site is necessary." The source of this statement should be referenced.

38     Section 5.1.2, Pages 5-9 through 5-14   It should be recognized that sample handling procedures exist that avoid both phthalate and volatile organic contamination. This may be an appropriate section in which to state that the laboratory chosen to perform analyses will be expected to employ procedures that avoid volatile organic and phthalate cross-contamination.

39     Section 5.2.1.3, Pages 5-16 through 5-27   The design of the pumping and tracer tests is basically sound. However, the tight spacing of the wellpoints may introduce significant error due to aquifer heterogeneity. The following potential sources of error have been identified:

- Error may be introduced by sediment stratification. All of the observation wells are within 45 feet of the pumping well. Distances of three to five times aquifer thickness are generally required to negate the effects of stratification.
- Well construction may compact alluvium around the casing. Compaction may result from displacement from driving the casing and settling from vibration. If

significant compaction occurs, the true hydraulic conductivity may be greatly underestimated

- Wells must be developed carefully, so that the percentage of fine-grained material in the surrounding sediment is neither increased or decreased. If a well is underdeveloped, the true hydraulic conductivity may be underestimated. If a well is overdeveloped, the true hydraulic conductivity may be overestimated.

Sources of error related to well spacing should be included in a discussion of aquifer test results

40 Section 5.2.3, Page 5-3, Paragraph 2 This paragraph states that all ground water samples other than those for organic compounds, major ion, and tritium analyses will be filtered in the field. EPA's "Resource Conservation and Recovery Act Ground-Water Monitoring Technical Enforcement Guidance Document" (TEGD) suggests that ground water samples for metal analyses be split into filtered (0.45 microns) and non-filtered portions. This is done because "particles which may be present in the well even after well evacuation procedures, may absorb or adsorb various ionic species to effectively lower the dissolved content in the well water." Ground water samples should be analyzed for total metals, as well as dissolved metals.

41 Appendices A-D, General Comments The appendices only present data above calculated upper tolerance limits. All data above detection limits should be presented, regardless of whether the detection limits are above or below upper tolerance limits. Tolerance limits and maximum background values for radionuclides should have an associated error term reported.

42 Appendix C Results from Woman Creek surface water sampling (SW-32, SW-33, SW-34) should be reported in Appendix C.